A diagnostic study on the influence of interactions between tropical and mid-latitude intraseasonal oscillations around the Tibetan Plateau on the extreme Yangtze floods

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This study examines the dynamic processes on intraseasonal timescales responsible for the devastating floods over the Yangtze Basin during June–August 1998. Wavelet analysis suggests that the unusual double Meiyu episodes over the south of the middle and lower reaches of the Yangtze River valley (SMLY) depended on the 25–60-day intraseasonal oscillation (ISO), which has an anomalous ascending branch over the SMLY and descending branch south of 20°N over eastern China. This vertical–meridional cell was not only regulated by the tropical ISO over the Asian summer monsoon region but also modulated by the mid-latitude ISO in the upper troposphere. The intraseasonal Rossby wave train along the Asian westerly jet, presenting as the anomalous anticyclone over the Tibetan Plateau (TP) sandwiched between anomalous cyclones in the upstream and downstream areas, tended to trigger another reversed vertical–meridional cell with updraft over the SMLY and downdraft to the north through vorticity advection. The phase-lock of these ascending branches over the SMLY produced the double Meiyu episodes. The duration of the SMLY flooding was also associated with the interactions between tropical and mid-latitude ISOs. During the first wet episode, as the tropical ISO-related upper-level divergent flows propagated northward to the southwestern TP, they tended to anchor the anticyclone over the TP through their interaction with the mid-latitude rotational circulation. This favored persistent ascent over the SMLY, and thus the prolonged Meiyu episode in June. In contrast, the northward propagation was confined to the central Bay of Bengal in July, leading to a short Meiyu episode.